DSOR LAB

UNIVERSITÄT PADERBORN

Taburoute

Operations Research B, Prof. Jacek Zak

June 23 – 25, 2008

Contents

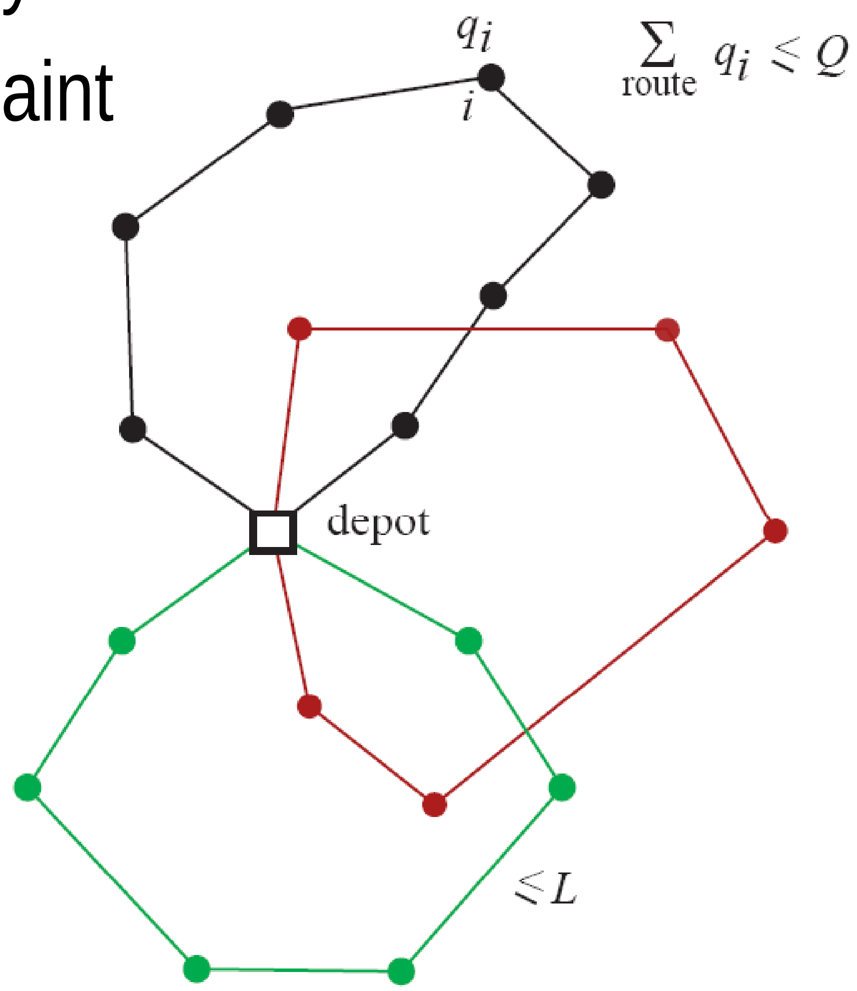
- Vehicle Routing Problem (VRP)
- Repetition of Tabu Search
- Introduction to Taburoute

Vehicle Routing Problem (VRP)

- Network existing of one depot and several customers being delivered by vehicles
- m identical vehicles based at the depot
- n customers
- c_{ij}: Distance (cost, travel time) matrix
- q_i: demand of customer i
- Q: vehicle capacity
- L: maximal route length (duration)

Vehicle Routing Problem (VRP) - Conditions

- Starting and ending at the depot
- Visiting each customer exactly once
- Satisfying the capacity constraint
- Satisfying the maximal length constraint
- Of minimal total cost



Repetition of Tabu Search

- Sequences of solutions are examined as in Simulated Annealing, but the next move ist made to the best neighbour of the current solution

- Solutions that were recently examined are tabu, for a specific number of itereations (avoiding cycles/tabulist)

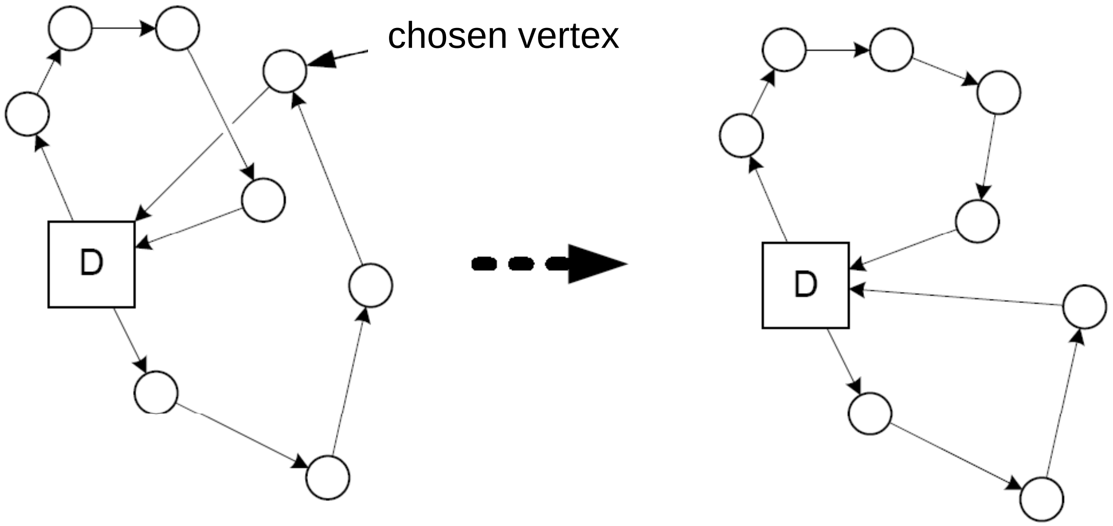
Repetition of Tabu Search

- Intensification: improvement of existing solutions (finding local optima)
- Diversification: don‘t terminate in local optima (jump around)
- Aspiration: neglecting the tabu restrictions (recently examined solutions are no longer tabu)

Introduction to Taburoute

- Neighbourhood: All solutions that can be reached from current solution

- Removing a vertex from its current route and inserting it into another route containing one of its p nearest neighbours (GENI = GENeralized Insertion procedure)



Introduction to Taburoute

- Uses Tabu tags instead of lists
  - After moving a vertex from r to s in iteration t, its reinsertion into r is **forbidden** until t + x (where x is a randomized integer out of [y,z])

Introduction to Taburoute

- False start:
  - Initially **several solutions** are generated
  - **Limited TS** is performed on each of them
  - The best one is used as the underlying **starting point** of the main search

Introduction to Taburoute

- Examination of **infeasible solutions** with respect to the capacity or maximum route length

- The objective function contains **two penalty terms** (overcapacity/overduration) weighted by a self-adjusting parameter
  - Divided (multiplied) by 2 if all 10 previous solutions were feasible (infeasible)

➔ Decreases the probability of beeing trapped in a local minimum

Introduction to Taburoute

- Diversification: Penalizing vertices that have been moved frequently

- Insensification: TS on n/2 vertices have been moved most frequently

- Post-optimization with US (Unstringing & Stringing) during the search process